



## OWNER'S MANUAL



**MS2500 WIRELESS MICROPHONE SYSTEMS**

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NOTE: Any change or modification or combination of changes or modifications made to this product without the express written authorization and approval from Electro-Voice, Inc. could void the user's authority to operate this equipment.

**WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK,  
DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE.**

## INTRODUCTION

You have purchased a wireless microphone system of superior quality, designed by the world's premier wireless company. Their many years of designing and building wireless systems for professionals and touring artists have resulted in the very best audio and rf circuits, and a tradition of careful attention to detail.

You will receive many years of superior service from your wireless microphone system, and a new-found freedom now that your movements are no longer restricted by a cable. Enjoy the experience. Thank you for your purchase.

## WHAT IS A WIRELESS MICROPHONE SYSTEM?

In a wireless microphone system, a radio-frequency (rf) signal substitutes for the cable, forming a circuit between the microphone and the amplification system. This system consists of two parts, the transmitter and the receiver. The transmitter sends the audio signal from the microphone to the receiver. An audio cable connects the output of the receiver to an amplification system.

Each wireless system must operate on a different radio-frequency band in order to avoid interference. At any given rf frequency, only one transmitter can be used at a time to send a signal to a receiver of the same frequency. Therefore, if multiple wireless systems are needed, separate receivers are required for each individual transmitter.

MS2500 wireless systems operate in the radio-frequency band between 169 and 216 MHz.

## FEATURES

### MT2500 Handheld Transmitter

- Electro-Voice N/D757B supercardioid dynamic microphone element, providing the ultimate in sound quality for lead vocal performance, with virtually no handling noise.
- Separate LED's for "power on" and "battery O.K."—operate wireless with confidence.
- Separate "power on" and "audio mute" transmitter switches.
- 50 milliwatts transmitter output power—the maximum legal limit for the greatest coverage area—and up to 10 hours of operation on a 9-volt alkaline battery.

### MB2500 Bodypack Transmitter

- Detachable mic cable with Tini QG (mini 4-pin XLR) connector. Available without mic, with the CO-100EX or LM20EX omni, CS-200EX uni lavalier microphones, or HM1 headset.
- LED indicator for "on/off" and "battery condition" status.
- Separate "power on" and "audio mute" transmitter switches.
- 50 milliwatts transmitter output power—the maximum legal limit for the greatest coverage area—and up to 10 hours of operation on a 9-volt alkaline battery.

### MR2500 True-Diversity Receiver

- True dual-receiver space diversity system for maximum range and reliability.
- 105 dB signal-to-noise ratio for noiseless operation.
- Clean, precise, and natural sound reproduction using proprietary DNX™ compander circuitry for audio processing.
- Ten-segment LED audio VU bargraph display, plus squelch and diversity status indicators on the receiver front panel, for fast and easy setup.
- Switchable low and high output level on professional XLR connector, and line output level on standard quarter-inch phone jack.
- Solidly built rack-mountable receiver with heavy-duty internal ac power supply, switchable for 115-V or 235-V operation, and detachable three-prong (grounded) power cable.
- Squelch control permits adjustment of receiver sensitivity.

## QUICKSTARTUP PROCEDURE

To put your MS2500 wireless system into operation immediately, use the following instructions. Review the detailed information in the remainder of the manual for additional ways to reach optimum performance and sound quality.

### MR2500 Receiver Setup

- 1) **Attach the whip antennas to the rear-panel antenna connectors**, twisting clockwise one-quarter turn to lock (disconnect by lightly pushing in and twisting counterclockwise one-quarter turn) (see Figure 1). Position the antennas in an upright "V" configuration (like TV rabbit ears). If the receiver is mounted in a rack, the whip antennas can be made to go straight back by loosening the Allen screw in the barrel of the BNC connector, pulling the antenna out, replacing it in the top of the BNC connector, and retightening the Allen screw. **Note:** dipole antennas provide better range and reliability in difficult installations. See section on antennas later in this manual.
- 2) **Keep the level low or off on the mixer/preamp/amplifier channel you will be using for the wireless.**
- 3) **Plug the receiver power cable into a standard 120-V ac outlet.** If used with other than a 120-V ac outlet, please see section on "Conversion from 115 to 235 Volt Operation."
- 4) **Plug one end of your audio cable (not supplied) into the appropriate output connector (XLR or quarter-inch) on the rear panel of the receiver (see Figure 2). Plug the other end of the audio cable into the mixer/preamp/amplifier input.** The receiver XLR output is balanced; for single-ended (unbalanced) applications, use only pins 1 (common) and 2 (signal high). The output level in this mode will be 6 dB less than for the balanced mode. The unbalanced quarter-inch output is line level only, and the XLR output is switchable low or high level. Do not connect either pin 2 or pin 3 to ground (common) at any time.
- 5) **Depress the POWER switch to turn the receiver on;** the green power LED will light.
- 6) **Turn the "AUDIO ADJ" control on the receiver rear panel to the "2:00" position** (see Figure 3). Begin with the control in this position; after you have adjusted the transmitter level, you may need to readjust the "AUDIO ADJ" control.

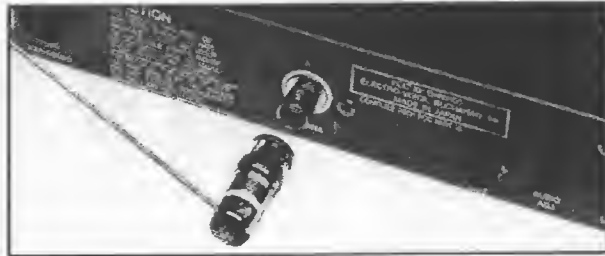


Figure 1 - Connect Antennas on Rear Panel

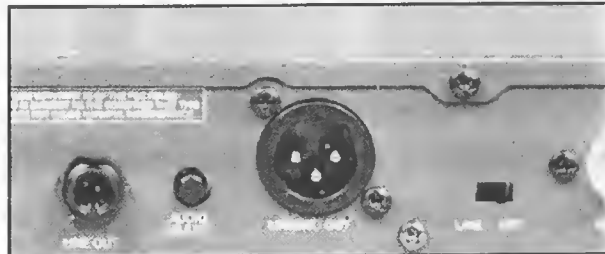


Figure 2 - Connect Audio Cable on Rear Panel



Figure 3 - Adjust Audio Output Level, Rear Panel



Figure 4 - Install 9 Volt Alkaline Battery into Transmitter



Figure 5 - Adjust Transmitter Audio Level Control

**MT2500 Handheld Transmitter Setup**

- 1) **Slide the cover of the handheld transmitter battery compartment** by pressing with your thumb on the two horizontal grooves (at the tail end of the transmitter) while gently pulling back. Carefully raise the hinged battery door. Insert a fresh 9-volt alkaline battery into the battery compartment, with the positive (smaller) terminal to the right (with the battery-compartment end of the case toward you). Gently push the battery all the way in and slide the cover back into place (Figure 4).
- 2) **Turn the transmitter on by sliding the power switch (nearest the battery compartment) forward toward the mic element.** Both the red and the green LED's above the power switch should light, indicating power to the circuitry and good battery condition. Position the transmitter in the approximate center of the area to be covered by the wireless system. Observe that both of the receiver SIGNAL LED's (orange) are lit, and that one of the DIVERSITY CHANNEL LED's (green) is lit.
- 3) **Turn the audio transmission on by sliding the audio switch (nearest the mic element) forward towards the windscreen.** As you speak into the microphone, the AUDIO LEVEL display on the receiver should show activity.
- 4) **Gently insert the provided screwdriver (or other 3/32" screwdriver) into the hole near the head of the transmitter** (see Figure 5). Turn lightly until the screwdriver tip drops into the slot in the level control. Begin with the transmitter mic-level adjustment in the attenuated position by gently turning counterclockwise until the control stops (the mic output is attenuated but is not "off"). Slowly turn the mic-level control clockwise while speaking or singing into the mic until the orange and the first red LED's on the receiver AUDIO LEVEL meter flash on the loudest voice peaks. If the "-20" and "-10" LED's on the receiver do not illuminate frequently and remain on fairly consistently, turn "up" the transmitter mic-level control. Note: Setting the mic level correctly maximizes the system signal-to-noise ratio while ensuring optimum audio quality. If the mic level is set too high, distortion, thumps, or pops due to overload may occur; if set too low, the system may "noise up" at times.

**MB2500 Bodypack Transmitter Setup**

- 1) **Open the hinged door by sliding down and then lifting to a 90 degree angle.** Place a fresh 9-volt alkaline battery, terminals first with the positive (smaller) terminal away from the battery door hinge, into the battery compartment. Close the door and slide up to latch. (Figure 4)
- 2) **Attach the lavalier microphone to the bodypack** by lining up the holes on the mic cable connector with the mating pins on the bodypack connector and pushing in until they lock (to detach the mic cable, push the small "button" on the mic cable connector and gently pull apart). Clip the microphone to the chest/collar area of the user's clothing.
- 3) **Turn the transmitter on by sliding the POWER switch (on the left next to the antenna) to the ON position.** The LED between the two switches should flash momentarily. Position the transmitter in the approximate center of the area to be covered by the wireless system. Observe that both of the receiver SIGNAL LED's (orange) are lit, and that one of the DIVERSITY CHANNEL LED's (green) is lit.
- 4) **Turn the audio transmission on by sliding the AUDIO switch (on the right) to the ON position.** As you speak into the microphone, the AUDIO LEVEL display on the receiver should show activity.
- 5) **Gently insert the provided screwdriver (or other 3/32" screwdriver) into the hole at the lower left-hand corner of the product label** (see Figure 5). Turn lightly until the screwdriver tip drops into the slot in the level control. Begin with the transmitter mic-level adjustment in the attenuated position by gently turning counterclockwise until the control stops (the mic output is attenuated but is not "off"). Slowly turn the mic-level control clockwise while speaking until several of the green LED's on the receiver AUDIO LEVEL meter are lit consistently (the orange and first red LED's may flash on the loudest voice peaks). If the LED between the two switches on the transmitter flashes on voice peaks, turn down the level on the transmitter.
- 6) **Clip the bodypack to the user's belt** or place loosely in a pocket. Make sure that the antenna is not twisted around the mic cable. Ideally, the antenna should be free, extended, and should run in the opposite direction of the mic cable. Placing the bodypack higher on the body can increase range.

**Final System Adjustments**

- 1) Turn up the level on the mixer/preamp/ amplifier to the normal setting.
- 2) Speak into the transmitter's microphone and, if necessary, adjust the AUDIO ADJ control on the back of the receiver until the volume level from the wireless system approximates the level of an equivalent wired system. If you desire greater level through the XLR output than you can obtain with the switch in the MIC position, turn the AUDIO ADJ control fully counterclockwise, switch to the LINE position, and slowly turn the AUDIO ADJ control clockwise while speaking or singing in the microphone.
- 3) "Walk" the coverage area to check for problems. If dropouts (little or no signal in small areas) occur, you may need to make adjustments. Check the battery to make sure it is fresh and new. Also check the antennas to make sure they are not touching each other or metal objects, and are not blocked by nearby metallic objects. There must be a clear path from the transmitter to the receiver for optimum operation.

**Note:** The transmitter may also be at its distance limit from the receiver. Maximum distance can vary quite widely depending on the environment where the system is used: number of reflective metal objects; rf interference sources such as DSP devices, computerized lighting controllers, and arcing or malfunctioning electrical devices (such as fluorescent lighting ballasts); and rf sources such as other wireless transmitters, TV broadcast antennas, etc.

- 4) In normal operation, the DIVERSITY LED's on the front panel of the receiver will switch back and forth from "A" to "B", indicating proper operation of the internal diversity circuitry. At very close ranges (15 feet, or 5 meters), the signal level may be too high for diversity switching. At longer ranges, failure of the LED's to switch while the transmitter is moving indicates some kind of problem (bad antenna or antenna connection, poor antenna location, transmitter too close to one antenna, etc.) which should be investigated and corrected.
- 5) Keep the transmitter POWER "on" whenever the receiver is attached to the audio system and the mixer channel's gain is turned up. If you need to turn off the transmitter's audio signal while it is in use, slide the AUDIO switch to the "off" position. Keeping the power "on" will prevent noise from digital and electrical sources from entering the receiver and being amplified by your audio system.

**Every piece of digital or computerized equipment, and many electrical devices and switches, will radiate rf energy to distances ranging from a few inches to several feet. This noise, when picked up by a wireless receiver, is often very loud and can come at random times. All wireless receivers will be affected by these sources of interference. The best way to avoid this disruption is to keep the transmitter's power "on." If you *must* turn off the transmitter power, first turn down the mixer channel so that any potential noise will not come through the audio system.**

**NOTICE****CONVERSION FROM 115- TO 235-VOLT OPERATION**

**DO NOT ATTEMPT TO MAKE THIS CONVERSION WITH POWER APPLIED TO THE RECEIVER! FULLY DISCONNECT THE AC POWER FROM BOTH THE RECEIVER AND THE AC OUTLET BEFORE PROCEEDING**

To operate the MS2500 system in countries using 220/240-volt ac supplies, you will need to convert the MR2500 receiver. Use the following procedure for conversion.

- 1) Make sure the receiver is disconnected from the power source.
- 2) The switch to change from 115-volt (110-V - 120-V) to 235-volt (220-V - 240-V) operation is located on the right side of the receiver (front panel facing you). It is accessible through a small hole on the side.
- 3) Insert a small, flat-bladed screwdriver through the hole into the receiver. A two-position switch is located just inside the hole. Slide the switch toward the rear panel of the unit. The positions for 115-volt and 235-volt operation are stamped into the metal on either side of the hole.
- 4) Change the receiver fuse to the appropriate size. Use a 1/4-amp fuse for 235-volt operation and 1/2-amp fuse for 115-volt operation.
- 5) Caution: Make certain that the voltage selector is in the correct position. Operating the receiver on 235 volts when it is set for 115-volt operation may cause serious damage, especially if the fuse has not been changed to the 1/4-amp size.
- 6) Attach the receiver to the power source using an appropriate power cable.

## SPECIFICATIONS

### MS2500 WIRELESS MICROPHONE SYSTEMS

#### FREQUENCY RANGE (Standard Frequencies)

169.505, 170.245, 171.045, 171.905, 178.225,  
179.200, 184.025, 185.125, 188.200, 191.300,  
195.425, 197.325, 202.425, 208.300, 209.175,  
214.150.

#### WORKING RANGE

Up to 1000 ft under ideal conditions; usually  
somewhat less in typical applications.

#### EMISSION/MODULATION

Direct FM, crystal-controlled, 15-kHz deviation, 60 f<sub>s</sub>

#### FREQUENCY RESPONSE

60 Hz to 14 kHz,  $\pm 1.5$  dB, 30 Hz to 16 kHz,  $\pm 3$  dB

#### HARMONIC DISTORTION

0.5% maximum, below transmitter limiting;  
0.25% typical at 1 kHz

#### DYNAMIC RANGE

105 dB

#### ULTIMATE S/N (processed, 20-kHz bandwidth)

105 dB (flat) minimum (108 dB typical A-weighted)

#### AUDIO PROCESSOR

DNX™ 2:1 logarithmic compressor and expander

#### OPERATING TEMPERATURE

-20 °C to +50 °C (-4 °F to +122 °F)

#### FCC DATA

Approved under Parts 15, 74, and 90, as applicable

### MR2500 DIVERSITY RECEIVER

#### RECEIVER TYPE

Single-frequency, single-conversion,  
superheterodyne FM

#### IMAGE REJECTION

80 dB, typical

#### SENSITIVITY

1.6  $\mu$ V for 50 dB S/N (processed), 20-kHz bandwidth

#### ULTIMATE QUIETING (S/N)

105 dB (20 kHz flat); 108 dB (A-weighted)

#### SQUELCH QUIETING

Greater than 105 dB (referenced to 15 kHz  
deviation)

#### AUDIO OUTPUT,

##### LINE (High) LEVEL

+12 to -18 dBm (at full deviation), +16 dBm  
minimum at clipping

##### MIC (Low) LEVEL

-18 to -46 dBm at full deviation (-30 to -60 dBm  
with normal headroom)

#### IF SELECTIVITY

200 kHz, 9 poles, monolithic ceramic and LC filters

#### RF SELECTIVITY

Approximately 5 MHz, 4-pole LC filter

#### ADJUSTMENTS AND CONTROLS

Power switch, low/high switch, output level adjust  
control, squelch control

### INDICATORS

Audio-level bargraph, diversity A/B LEDs, RF-signal-  
detect A/B LEDs, power ON/OFF LED

### POWER

115 V ac, or 235 V ac (internal switch selectable)  
50/60 Hz, 10 W

### WEIGHT

6 lbs, 10 oz (3 kg)

### DIMENSIONS (excluding rack-mount ears)

1.75 in (4.45 cm) high, 16.9 in (42.9 cm) wide,  
9 in (23 cm) deep

### MT2500 HANDHELD TRANSMITTER

#### MIC ELEMENT

Electro-Voice N/D757B supercardioid

#### POWER OUTPUT

50 mW nominal

#### FREQUENCY STABILITY

$\pm 0.005\%$

#### SPURIOUS OUTPUT

-45 dB minimum, -55 dB typical

#### CONTROLS

Power on/off, mic-audio on/off, mic-level adjust

#### AUDIO ADJUSTMENT RANGE

30 dB

#### BATTERY LIFE

8-10 hours with one 9-V alkaline

#### SIZE

10.25 in (26.0 cm) long

#### WEIGHT

10.5 oz (297.7 g), with battery

### MB2500 BODYPACK TRANSMITTER

#### POWER OUTPUT

50 mW nominal

#### SPURIOUS OUTPUT

-45 dB minimum, -55 dB typical

#### ADJUSTMENTS AND CONTROLS

Power on/off, audio on/off, battery overload/low  
indicator, mic-level adjust

#### AUDIO ADJUSTMENT RANGE

30 dB

#### BATTERY LIFE

8-10 hours with one 9-V alkaline

#### ANTENNA

Attached external limp wire

#### SIZE

1.0 in. x 2.5 in. x 4 in. (without belt clip)

#### WEIGHT

5.5 oz (159.7 g), with battery



## DIVERSITY OPERATION

The MR2500 receiver is a true dual-receiver space diversity design, which is the optimum technique for eliminating potential dropouts caused by reflected signals. A signal from the transmitter can reflect off surfaces such as air-conditioning ducts, equipment cabinets, and other metal objects, arriving 180 degrees out of phase with the direct or other reflected signal, and causing a "phase cancellation" of the entire signal. With a diversity system, such a phase-cancelling condition virtually never exists on both antennas at the same time. A true dual-receiver diversity system such as the MR2500 automatically switches to the antenna/receiver with the strongest signal, thus maintaining maximum reliability.

## RECEIVER CONTROLS, CONNECTORS, AND INDICATORS

The MR2500 diversity receiver is extremely easy to set up and operate. The only controls are a power ON switch, a MIC/LINE output level switch, and an adjustable output level control. Once initial setup has been performed using these controls and front-panel indicators, the MIC/LINE switch and the output level control will probably not require resetting unless the system is used for a different application.

### Front Panel:

**"POWER" LED and Switch:** Turns the receiver "on" and "off" and indicates when the power is active.

**"AUDIO LEVEL" Display:** Ten-segment LED bargraph-type display to indicate the peak audio input level to the receiver. The metering point is before the "MIC/LINE" switch and the output attenuator, so changes in these two controls will not affect the display reading.

**"DIVERSITY CHANNEL" LED's:** Indicate which receiver channel has been selected by the internal diversity circuitry. Proper diversity-circuit operation is occurring when these indicators switch back and forth (except at very short ranges, when one of the indicators locks on, due to strong-signal saturation of both channels.)

**"RF SIGNAL" LED's:** Indicate that the associated channel is receiving a signal from the transmitter. If one LED is "on" most of the time while the other is "off" far more than it is "on," a problem exists (such as a bad receiving antenna, poor antenna location, transmitter too close to one antenna, etc.).

### Rear Panel:

**"ANTENNA" Connectors:** Type BNC for use with the whip antennas supplied.

**"AUDIO" Output Connectors:** (a) Standard, full-sized, three-pin male XLR for balanced audio output, switchable from low to high level; (b) 1/4-inch phone, line level output only.

**"AUDIO ADJ" Control:** Provides 30 dB of level control to the XLR and quarter-inch output connectors. This control works in conjunction with the MIC/LINE switch to provide a greater range of potential output level adjustment on the XLR connector.

**"MIC/LINE" Output Level Switch:** Selects low level ("mic" level) or high level output to the XLR connector. Depending on the setting of the AUDIO ADJ control, output is approximately -24 to -54 dBm in the MIC position and 0 dBm to -30 dBm in the LINE position at normal input levels.

**"SQUELCH" Control:** The squelch control on the rear of the receiver adjusts the sensitivity of the receiver to rf signals—from both the transmitter and from other sources. The normal setting for this control is in approximately the one o'clock position. Adjust the squelch control for the following conditions:

a) Turn the control clockwise to eliminate external rf interference (noise) when the receiver is on and the transmitter is off, or if the receiver is located close to rf-emitting sources and cannot be moved to another location. Turn it just far enough to eliminate the interference. The potential range of the wireless system will also be lessened;

b) Turn the control counterclockwise for increased receiver sensitivity when using the transmitter at extreme ranges, or as a possible remedy for signal dropouts. First check the condition of the transmitter battery, the location of the receiver and the antennas (line-of-sight, located away from reflective metallic objects and surfaces, etc.) and other possible conditions that could lead to signal dropout. Realize that by making the receiver more sensitive, it will pick up lower level (not as strong) interfering rf signals if the transmitter is off—which may lead to noise when none was apparent before. Check the effect with the receiver off to determine whether or not interference is present.



## HANDHELD TRANSMITTER CONTROLS AND INDICATORS

**Power Switch:** Recessed switch located near the battery compartment; turns transmitter rf and audio circuitry on and off.

**Audio Switch:** Switch located near the mic head; turns the audio transmission on and off without affecting the rf circuit and the wireless connection with the receiver.

**Audio Gain Control:** 3/32" or provided screwdriver adjustment for transmitter preamplifier gain, with approximately 30 dB of range. The control is recessed and is accessible through a hole in the mic handle, located to the left of the mute switch.

**LED Indicators:** Two separate LED's are provided, indicating transmitter on/off status and battery condition. The red LED remains lit to indicate that the transmitter rf and audio circuits are on. The green LED remains lit until battery power reaches a level where it will soon need replacement.

## BODYPACK TRANSMITTER CONNECTORS, CONTROLS, AND INDICATORS

**Power Switch:** Located on the left side of the connector/control panel; turns transmitter rf and audio circuitry on and off.

**Audio Switch:** Located on the right side of the connector/control panel; turns the audio transmission on and off without affecting the rf circuit and the wireless connection with the receiver.

**Audio Gain Control:** 3/32" or provided screwdriver adjustment for transmitter preamplifier gain, with approximately 30 dB of range. The control is recessed and is accessible through a hole in the lower left corner of the product label.

**TA4M Connector:** To connect a lavalier microphone to the bodypack transmitter, providing bias current for the condenser element and a path for the audio signal. Accepts a TA4F connector, with positive bias (pin #1), positive bias plus audio signal path for two-wire condensers (pin #2), audio signal (pin #3), and ground (pin #4).

**LED Indicator:** Located between the two switches, the LED plays three roles. When the unit is first turned on, the LED will momentarily flash. When the battery voltage is below 7 volts, signaling the need to change the battery soon, the LED will remain lit. When the input is overdriven, the LED will flash on the peaks.

## ANTENNAS

The receiver antennas may be the most important components in a wireless system. However, antennas are the most often overlooked items in setting up a system, and are frequently the cause of unnecessary problems. Properly locating the receiving antennas is vitally important in any wireless system. Whip antennas (as supplied with the MS2500) connected directly to the wireless receiver are adequate for many installations. When the distance between the receiver and the transmitter is 200 to 400 feet (60-120 m) or less, and the path between the receiver and the transmitter is clear and unobstructed line-of-sight, good results usually can be obtained. However for unusual applications, such as operating at extreme ranges of 500 feet (150 m) or more, other types of antennas may be needed. TV antennas (with an appropriate matching transformer) are often used for this purpose. A "high-band" wide-bandwidth yagi antenna (Winegard K5-713, or similar) works well. VHF communications antennas are also sometimes used for specialized requirements. However, such antennas are usually narrow-band and must be modified to function properly in the 169 to 216 MHz range.

## COMPATIBILITY

The receiver's VHF high-band frequency must be the same as the transmitter's frequency. If a frequency change is required, both the transmitter and the receiver should be returned to the factory or authorized service location. Because of the very high performance of these units and the specialized test equipment required to adjust them properly, owners should not attempt to change frequency themselves.

If two or more systems are used simultaneously at the same location, proper frequency selection is required to avoid interference. Frequency spacing is one factor; frequency mixing is another, involving not only the wireless frequencies but also frequencies generated by other transmitters such as local TV stations. Many complex formulas must be used to determine frequencies resulting from a mix. Contact your dealer or Electro-Voice for frequency-selection assistance if you are planning to operate multiple wireless systems at the same location.

## RACK MOUNTING

The MR2500 receiver may be mounted in a standard rack using the provided rack ears. Simply remove the two screws on both sides of the receiver adjacent to the front panel, put the rack ears in place, and screw them on. The receiver is one rack space high.

Mounting of the antennas is often more difficult when the receivers are in a rack. Several methods may be used for effective antenna reception. The provided whip antennas can be configured to go straight out the back of the rack. Also, external dipole antennas may be purchased. These antennas typically consist of a length of cable, with a male BNC connector on one end and a small "box" with two opposing antennas on the other end. Dipole antennas allow the user to "remote" the antennas, placing them higher, away from interfering equipment or metal structures, and nearer the area where the transmitter will be used. It is not effective to simply make an "extension cable" and attach a whip antenna to the end; range will probably diminish.

Some people who use a single wireless unit in a rack will mount the receiver in the top space and then will cut small holes in the top of the rack case right above the connectors. They can then feed the whip antennas through the holes and attach them to the receiver. With this technique, most of the antenna length will be exposed and in the line of sight with the transmitter.

A one-rack-space antenna panel, such as our RAK-2, may be purchased or made from parts acquired from electronics or music dealers. The basic components of this device are a metal panel that is drilled (or preferably D-punched) to accommodate two female-to-female BNC bulkhead connectors (UG-492 type), and two short (1 to 2 feet) RG-58 cables with male BNC connectors on both ends. The bulkhead connectors should be in contact with the metal of the rack panel; scrape off the paint adjacent to the hole to make contact. Attach the BNC cables at one end to the receiver connectors and the other end to the interior side of the bulkhead connectors. Attach the whip antennas, provided with the MS2500 system, to the exterior side of the bulkhead connectors. Place these antenna panels near the top of the rack. More than two of these devices in a rack may begin to interfere with each other.

When using multiple wireless systems together, a multicoupler can also be useful. These devices allow up to four wireless receivers to be "fed" by a single set of antennas. Multicouplers are active devices, requiring power, and are available in both single-channel and dual-channel (diversity) versions. Two single-channel devices may be used together to function as a dual-channel multicoupler. Multicouplers reduce the number of receiving antennas, giving a "cleaner" look. However, without careful frequency selection, they can increase the chances for intermodulation interference between systems.

Relative positioning of the wireless receiver in the rack is important in order to receive optimum performance and minimize the chances for interference. First and foremost, digital signal processing units act as broadband rf noise generators, radiating electromagnetic energy from the chassis and connectors (and often from attached unshielded cables). They will emit energy throughout the VHF band, and will typically produce "spikes" that are much stronger than the average level.

A digital signal processor mounted adjacent to or near a wireless receiver will induce a signal at the receiver's antenna that may be as strong as the signal of a transmitter 50 or 100 feet away. The receiver is easily capable of "seeing" this signal. When the transmitter is turned off, you may notice both of the orange signal LEDs flickering or lit, and perhaps one of the green DIVERSITY CHANNEL LEDs will be lit. You also may notice random "spikes" on the AUDIO LEVEL meter. If the receiver is plugged into an amplification system, you will hear noise along with these "spikes." Turning on the transmitter will usually override this interference.

It is always best to rack mount the wireless receiver separately, or with analog devices. If this placement is not possible, remoting the antennas, keeping the transmitter on whenever the receiver is on, and/or turning down the gain on the amplification system when the transmitter is not in use will alleviate the potential problems.